

MANUFACTURING PROCESS FOR A MICROWAVE ANTENNA USING
WAVEGUIDE TECHNOLOGY

5 The invention relates to a manufacturing process for
a microwave corrugated-horn antenna using waveguide
technology.

10 This type of antenna is generally made up of several
molded parts. In particular, for making the
corrugated horn, the manufacturing process consists
in molding two half-parts that are symmetrical
relative to an axial plane of the horn. The number of
molds required for the manufacture of the various
elements of such an antenna can become prohibitive
with a view to high-volume, low-cost production.
15 Moreover, the alignment and interconnection of the
various elements of the antenna, in order to limit
the electrical discontinuities, lead to manufacturing
constraints that impact the production cost of the
antenna.

20 Figure 1 shows a perspective view of an example of a
microwave antenna using waveguide technology
comprising a corrugated horn 1 with, amongst other
features, a frequency separator 2. The corrugated
horn 1 is formed by assembly of two symmetrical half-
25 parts.

30 The use of blocks of synthetic foam, such as
polymethacrylimide, for constructing microwave
devices using waveguide technology is known from the
document "Foam technology for integration of
microwave 3D functions" - ELECTRONICS LETTERS 14
October 1999 - Vol.35 N°21. In particular, this
document proposes the construction of a 3D bandpass
filter by molding of a block of foam. A manufacturing
process for a horn antenna, according to the abstract
35 of the Japanese patent JP-A-59107607, is also known
that consists in rolling a fiber-reinforced plastic
into the grooves of a conical mold so as to form a
corrugated horn whose corrugations are metallized.

A process for depositing a metallic film onto a block of foam for manufacturing microwave antennas using waveguide technology is also known from the French patent document n°2780319.

5 The aim of the invention is to propose a process for manufacturing, from a block of synthetic foam, a microwave corrugated-horn antenna using waveguide technology, which process is designed for low-cost volume production, but which avoids the drawbacks
10 indicated above.

The process according to the invention consists in forming the corrugations of the horn on the external surface of a block of synthetic foam and in subsequently metallizing the surface of the conformed
15 block of foam to form the antenna. With this process, the corrugated horn can be manufactured as a single piece, which will contribute to eliminate the electrical discontinuities in the antenna.

The conformation of the external surface of the block
20 of foam for forming the corrugations of the horn is preferably obtained by thermoforming according to a hot-press molding technique. The preform of the block of foam used for forming the horn will preferably be substantially conical.

25 The surface metallization of the block of foam is preferably carried out by projection or using a brush, or alternatively by dipping in a metallic bath.

30 The synthetic material used for the foam will preferably be a polymethacrylimide foam, marketed under the name of "ROHACELL HF", that exhibits, amongst other advantages, a good compromise between rigidity, low dielectric constant and low losses.

35 In addition, the external surface of several sections of the same block of foam can be conformed by hot pressing in a mold in order to form, as a single piece, a microwave antenna comprising, successively, a corrugated horn, an impedance adapter and a polarizer.

1a

CLAIMS

1. A manufacturing process for a microwave corrugated-horn antenna (5) using waveguide technology, characterized in that it consists in forming the corrugations (6) of the horn on the external surface of a block of synthetic foam (3) by deformation of said external surface and in then metallizing the surface of the conformed block of foam in order to form the antenna.
2. The process as claimed in claim 1, wherein the corrugations of the horn are formed by hot pressing of the block of foam in a mold (4).
3. The process as claimed in claim 1 or 2, wherein the metallization of the surface of the block of foam is carried out by projection or using a brush, or alternatively by dipping.
4. The process as claimed in one of claims 1 to 3, wherein two radial slots (8, 10) are formed in a cylindrical section of the block of foam by thermoforming and the surface of this section of the block of foam is metallized in order to form a waveguide polarizer.
5. The process as claimed in one of claims 1 to 4, wherein a circular groove (12) is formed in another section of the block of foam by thermoforming and the surface of this other section of the block of foam is metallized in order to form an impedance adapter.
6. A microwave corrugated-horn antenna using waveguide technology, characterized in that it is formed from a block of synthetic foam having, on its external surface, corrugations obtained by

deformation of said surface, said corrugations being metallized.

7. The antenna as claimed in claim 6, characterized in that it comprises, in addition, a waveguide polarizer formed by two radial slots (8, 10) formed in a first cylindrical section of the block of foam, this first section being metallized.

10 8. The antenna as claimed in either of claims 6 and 7, characterized in that it comprises, in addition, an impedance adapter formed by a circular groove formed in a second section of the block of foam, this second section being metallized.